Memorandum
USEPA Region 5
Land and Chemicals Division

To: File

Date: May 6, 2009

From: Todd D. Ramaly
Christopher Lambesis

RCRA Programs Branch

Re: Calculations of Metal Feed Rates Used During the 2008 Test Burns at Veolia Environmental Services, LLC, Sauget, IL

In October 2008, Veolia Environmental Services, LLC (Veolia) of Sauget, Illinois, submitted results from test burns conducted in August and September of 2008 on each of the three hazardous waste incinerators at the Sauget facility. These results are contained in the following reports: *Metals Performance Test Report Prepared for the Fixed Hearth Incinerator Number 2 in Accordance with 40 CFR § 63 Subpart EEE*, ENSR Corporation, October 2008; *Metals Performance Test Report Prepared for the Fixed Hearth Incinerator Number 3 in Accordance with 40 CFR § 63 Subpart EEE*, ENSR Corporation, October 2008; and *Metals Performance Test Report Prepared for the Rotary Kiln Incinerator Number 4 in Accordance with 40 CFR § 63 Subpart EEE*, ENSR Corporation, October 2008.

Analytical laboratory reports submitted as supporting documentation to these test burn reports did not specify whether or not the data for solid samples was expressed as concentrations in "wet weight" (meaning in the waste "as is") or by "dry weight" (meaning in a concentration normalized for moisture content). The concentration of a given element or compound can vary widely with changes in moisture content of the media. In case of soils, the concentration of pollutants can change significantly if the sample was collected just after a rainfall versus after several days of dry weather. When chemically analyzing the soil, the extra moisture content (such as from rainfall) can dilute the dry concentration of pollutants. Since the concentration of pollutants in the soil can trigger regulatory determinations, influence risk assessments, or exceed clean-up goals, the variation of moisture content must be addressed. Analytical laboratories typically report environmental samples of solids like soil in "dry weight," and include the mass fraction of the samples that are either moisture or solids (non-moisture) for "dry weight" data.

It is important to know whether or not the chemical analysis of waste feed during a test burn is expressed in "dry weight" or "wet weight" because the mass balance of the inputs to the incinerator that is needed to calculate pollutant feed rates and other

measurements of system performance (such as system removal efficiency) must match the condition of the waste feed as it was charged to the incinerator. Since the non-liquid waste feeds were sampled in the exact wet form in which they were burned and the mass of the waste feeds were measured "as is" or wet, the analytical results must be in "wet weight" for these calculations. Analytical results based on "dry weight" can be easily converted to "wet weight" by multiplying the "dry weight" concentration by the value of one minus the fraction moisture content. The data package submitted by Veolia did not specify under which convention the metals data were reported or provide the mass fraction moisture or mass fraction solids.

On October 29, 2008, the U.S. Environmental Protection Agency's Christopher Lambesis contacted Mike Challis, of Maxxam Analytical, Inc. (Maxxam), the laboratory that conducted the metal analysis for Veolia, to determine whether or not the solids data was expressed in "dry weight" or "wet weight" (Attachment 1). Mr. Challis stated that Veolia's data in Maxxam's lab reports were reported in "dry weight." As such, they would not be appropriate for use in metal feed rate calculations without conversion to "wet weight." EPA asked Veolia's Dave Klarich to obtain the dry weight analytical results from Maxxam and submit to EPA. On December 5, 2008, Veolia's Doug Harris confirmed in an electronic message that they "found a mistake that lowers the mercury feed in the waste" (Attachment 2). In order to obtain metal feed rates that matched the burn condition by converting the apparent "dry weight" results to "wet weight," we recalculated the metal feed rates for the 2008 Veolia test burns assuming the metals concentrations for solid feed streams (*Container Solids* for all three incinerators, and *Bulk Solids* for incinerator number 4) are expressed in "dry weight." We converted these values to "wet weight" using percent moisture data provided by Veolia's secondary lab, PSC Republic Environmental Systems (Pennsylvania) LLC (PSC Republic).

We also recalculated system removal efficiencies (SREs) since "wet weight" feed rates must be used in calculating SREs. See Table 1, below, for a summary of the metal feed rates and mercury SREs. The overall effect on the actual feed rate depended on the metal contribution of solid test burn wastes relative to that of metal spikes. In some instances, such as the mercury feed rate for Units 2 and 3, a significant portion of the total mercury burned came from the solid wastes, and the new calculation of mercury feed rates is significantly different than that originally provided by Veolia. Since the solid wastes burned for Unit's 2 and 3 provided insignificant amounts of SVM and LVM to the test, the dry weight adjustment did not significantly change the claimed test feed rate for SVM or LVM.

Veolia provided EPA with some updated calculations in December 2008 however, these were incomplete. In an electronic message dated December 10, 2008, Veolia's Doug Harris provided several spreadsheets which included new updated feed rates and estimated SREs. The information only addressed mercury feed rates and did not explain the drop in feed rates. Since Veolia's new reported feed rate for Stack 4 mercury is identical to EPA's (in Table 1), it is likely that the new number reflects the "dry weight" correction to "wet weight." The reductions in estimated feed rates for Units 2 and 3 did not match EPA's estimate, however. It was not apparent why the new feed

rates differed from EPA's feed rates without a clear accounting as to whether the data were reported as "wet weight" or "dry weight" and information from Maxxam on the values for moisture content, if they exist. Table 2 summarizes the updated mercury feed rates from Veolia's electronic message with Veolia's original rates and EPA's recalculated rates.

In March 2009, Veolia responded to requests for clarification on the issue of wet weight or dry weight. Veolia indicated that Maxxam provided percent moisture for the solid wastes and that the December recalculations of mercury feed rates were based on converting dry weight to wet weight using the new Maxxam percent moisture data. Maxxam provided new moisture data for container solids samples from Unit 2 and Unit 3 test burns only. Veolia used existing percent moisture data from PSC Republic to recalculate the metal feed rates for Unit 4. According to the new Maxxam report, the new percent moisture data for Units 2 and 3 came from samples analyzed on November 20, 2008; approximately 3 months after the samples were received. Analysis for moisture content is typically done soon after the laboratory receives the samples and a "holding time" restriction is often imposed requiring the analysis be completed within 14 days of sample receipt. The new results differed greatly from percent moisture values provided by both Maxxam's subsidiary lab, PSC Republic, and EPA's Central Regional Laboratory just a few weeks after the test burns. See Table 3 below for a direct comparison.

The solids used for most of the tests came from a single waste stream. Bulk solids are expected to have lower moisture content than the container solids because sand was added to achieve a particular test condition. EPA does not know why container solids used for the September rerun of the Unit 2 test burn would be much drier than container solids used in August. All container solids used during the August test burns were consistent in moisture content as reported by PSC Republic. We expect the PSC Republic samples were provided by Maxxam from split samples taken from the original sample set sent to Maxxam directly from the test burns as this is a common practice and the samples were noted as received by PSC Republic within approximately 10 days of the test burns. Furthermore, EPA's laboratory obtained similar results to those of PSC Republic on split samples collected at the test burns. Veolia has not explained why the Maxxam moisture data should be used instead of the values provided by PSC Republic or why they are so different. In addition, Veolia has not explained why they wish to use Maxxam's new moisture data to correct the dry weights for Units 2 and 3, but continue to use the PSC Republic moisture data for its recalculation of Unit 4 feed rates.

From this information, we believe the moisture content analysis from PSC Republic should be used for converting dry weight to wet weight because the analysis was conducted in a timely manner, the results were consistent for the single waste stream used in the tests, and split samples analyzed by EPA's laboratory provided similar results.

Table 1. Metal Feed Rate Comparison - Veolia Environmental Services, Inc., Sauget, Illinois

| Unit | Metal Group | Test Feed Rate Claimed by Veolia from August-Sept 2008 (lbs/hr) | Overestimated by (%) | System Removal Efficiency Using Veolia's Claimed Feed Rates (%) | Test Feed Rate Calculated by EPA (lbs/hr) | System Removal Efficiency Using Test Feed Rate Calculated by EPA (%) | Percent of Historical Feedrate (%) | Highest Feed Rate between 7/1/04 and 1/1/08 (lbs/hr) | Veolia's Proposed Extrapolated Feed Rate (lbs/hr) |
|---|---|---|---|---|---|---|---|---|---|
| 2 | Mercury | 0.0047 | 154% | 82.63% | 0.00185 | 55.51% | 34.3% | 0.00540 | 0.017 |
| | SVM | 63 | - | NC | 63.6 (Aug),62.9(Sept) | NC | 124.9% | 50.6 | 459 |
| | LVM | 47 | - | NC | 47.2 (Aug),46.8(Sept) | NC | 55.2% | 84.5 | 399 |
| 3 | Mercury | 0.0047 | 154% | 83.22% | 0.00185 | 54.47% | 33.9% | 0.00545 | 0.017 |
| | SVM | 63 | - | NC | 64.3 | NC | 89.1% | 72.1 | 459 |
| | LVM | 47 | - | NC | 47.7 | NC | 61.7% | 77.3 | 399 |
| 4 | Mercury | 0.031 | 19% | 96.04% | 0.026 | 95.36% | 43.5% | 0.05981 | 0.257 |
| | SVM | 65.2 | 2.5% | NC | 63.6 | NC | 109.6% | 58.4 | 500 |
| | LVM | 55.3 | 10% | NC | 50.3 | NC | 71.9% | 69.9 | 500 |

NC – not calculated

Table 2. Updated Mercury Test Feed Rates – Veolia Environmental Services, LLC, Sauget, Illinois

| Unit | Test Feed Rate Claimed by Veolia in the October 2008 Test Burn Reports | New Test Feed Rate Claimed by Veolia in December 2008 | Test Burn Feed Rates Estimated by EPA Converting Dry Weight Results to Wet Weight |
|---|---|---|---|
| 2 | 0.0047 lbs/hr | 0.0034 lbs/hr | 0.00185 lbs/hr |
| 3 | 0.0047 lbs/hr | 0.0044 lbs/hr | 0.00185 lbs/hr |
| 4 | 0.031 lbs/hr | 0.026 lbs/hr | 0.026 lbs/hr |

| Table 3. Comparison of Moisture Content– Veolia Environmental Services, LLC, Sauget, Illinois | | | |
|---|---|---|---|
| Sample | PSC Republic August, September 2008 | EPA CRL August 2008 | New Maxxam Data November 20, 2008 |
| August 2008 Test Burns | | | |
| Unit 2 – Run 1 – Container Solids | 74% | NA | 32.3% |
| Unit 2 – Run 2 – Container Solids | 74.3% | NA | 31.4% |
| Unit 2 – Run 3 – Container Solids | 77% | NA | 40.0% |
| Unit 3 – Run 1 – Container Solids | 75.1% | 76.2% | 10.4% |
| Unit 3 – Run 2 – Container Solids | 71.5% | NA | 16.3% |
| Unit 3 – Run 3 – Container Solids | 76.3% | NA | 19.8% |
| Unit 4 – Run 1 – Container Solids | 76.6% | 78.1% | NA |
| Unit 4 – Run 2 – Container Solids | 76.2% | NA | NA |
| Unit 4 – Run 3 – Container Solids | 78.6% | NA | NA |
| Unit 4 – Run 1 – Bulk Solids | 20.8% | 24.6% | NA |
| Unit 4 – Run 2 – Bulk Solids | 22% | NA | NA |
| Unit 4 – Run 3 – Bulk Solids | 34.6% | NA | NA |
| September 2008 Test Burn | | | |
| Unit 2 – Run 1 – Container Solids | 31.9% | NA | 1.9% |
| Unit 2 – Run 2 – Container Solids | 30.6% | NA | 2.1% |
| Unit 2 – Run 3 – Container Solids | 32% | NA | 2.4% |

Attachment 1

Conversation Log
October 29, 2008 - Chris Lambesis, EPA with Mike Challis, Maxxam Analytical, Inc.

Attachment 2

Electronic Message
December 5, 2008 – Doug Harris, Veolia Environmental Services, LLC to Todd Ramaly, EPA

Attachment 3

Electronic Message with Attachments
December 10, 2008 - Doug Harris, Veolia Environmental Services, LLC to Todd Ramaly, EPA

**Doug.Harris@veoliaes.com**
12/10/2008 01:10 PM

To Todd Ramaly/R5/USEPA/US@EPA
cc
bcc

Subject Fw: Hg SRE Spreadsheets

Todd,

Here's the info. Let me know if you need anything else.

Doug Harris
General Manager
Veolia ES Technical Solutions, L.L.C.
#7 Mobile Avenue
Sauget, IL 62201
Office: 618-271-2804
Cell: 618-616-7420
Fax: 618-271-2128
----- Forwarded by Doug Harris/OES/ONYX on 12/10/2008 01:08 PM -----

David Klarich/OES/ONYX
12/10/2008 09:49 AM

To Doug Harris/OES/ONYX@EMAIL
cc
Subject Hg SRE Spreadsheets

Here are the spreadsheets with the calculations below the graph.

(See attached file: Unit2HGremovalgraphrevised1125.xls)(See attached file: Unit3HGremovalgraphrevised1125.xls)(See attached file: Unit4HGremovalgraphrevised1125.xls)


Unit2HGremovalgraphrevised1125.xls


Unit3HGremovalgraphrevised1125.xls


Unit4HGremovalgraphrevised1125.xls

Doug.Harris@veoliaes.com
12/05/2008 11:17 AM

To Todd Ramaly/R5/USEPA/US@EPA
cc David.Klarich@veoliaes.com
bcc

Subject Mercury SRE Graphs

History: This message has been replied to and forwarded.

Todd,

Wanted to send you an update on the Mercury SRE Graphs. We found a mistake that lowers the mercury feed in the waste (some questions Chris asked got us thinking and questioning... we owe him lunch!!). We've sent these to Charlie and explained the change. As you'll see by the graphs, although the slopes flattened, all SRE's remain better at the higher feed rates as before. Have a good weekend and give Dave or I a call if you have any questions.

(See attached file: UNIT2_HgSRErevised1125.doc)(See attached file: UNIT3_HgSRErevised1125.doc)(See attached file: UNIT4_HgSRErevised1125.doc)

Doug Harris
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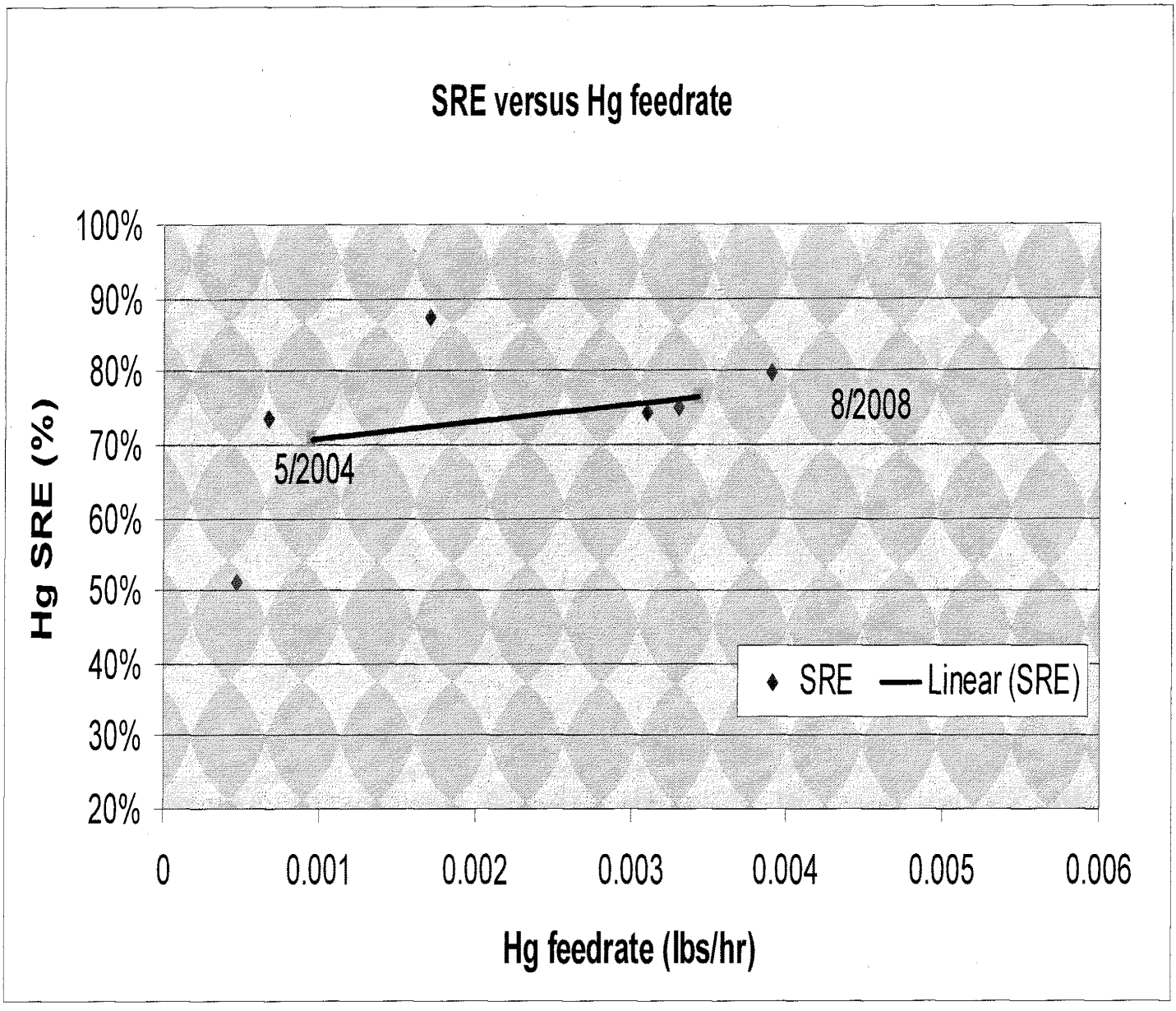
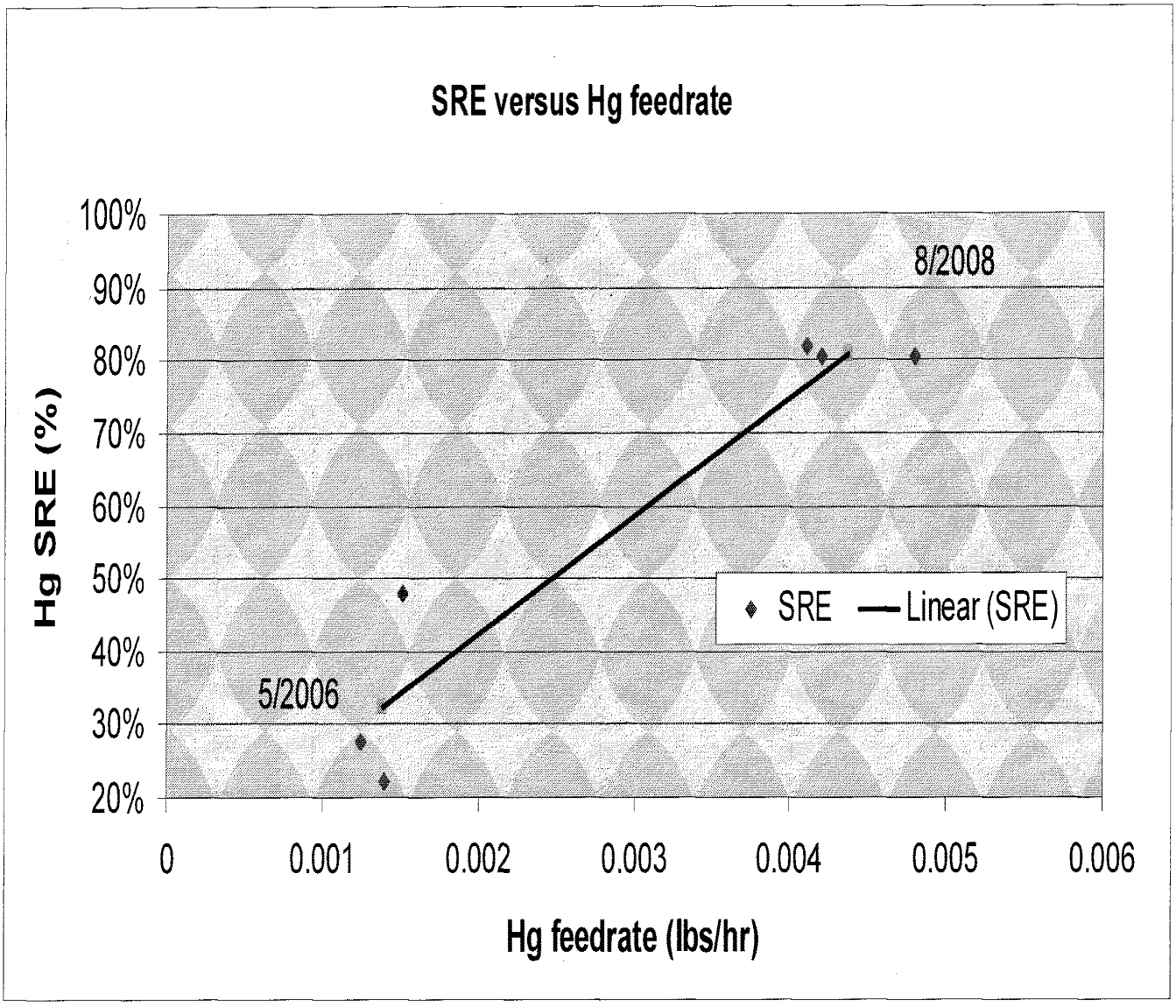
UNIT2_HgSRErevised1125.doc UNIT3_HgSRErevised1125.doc UNIT4_HgSRErevised1125.doc

# Unit-2



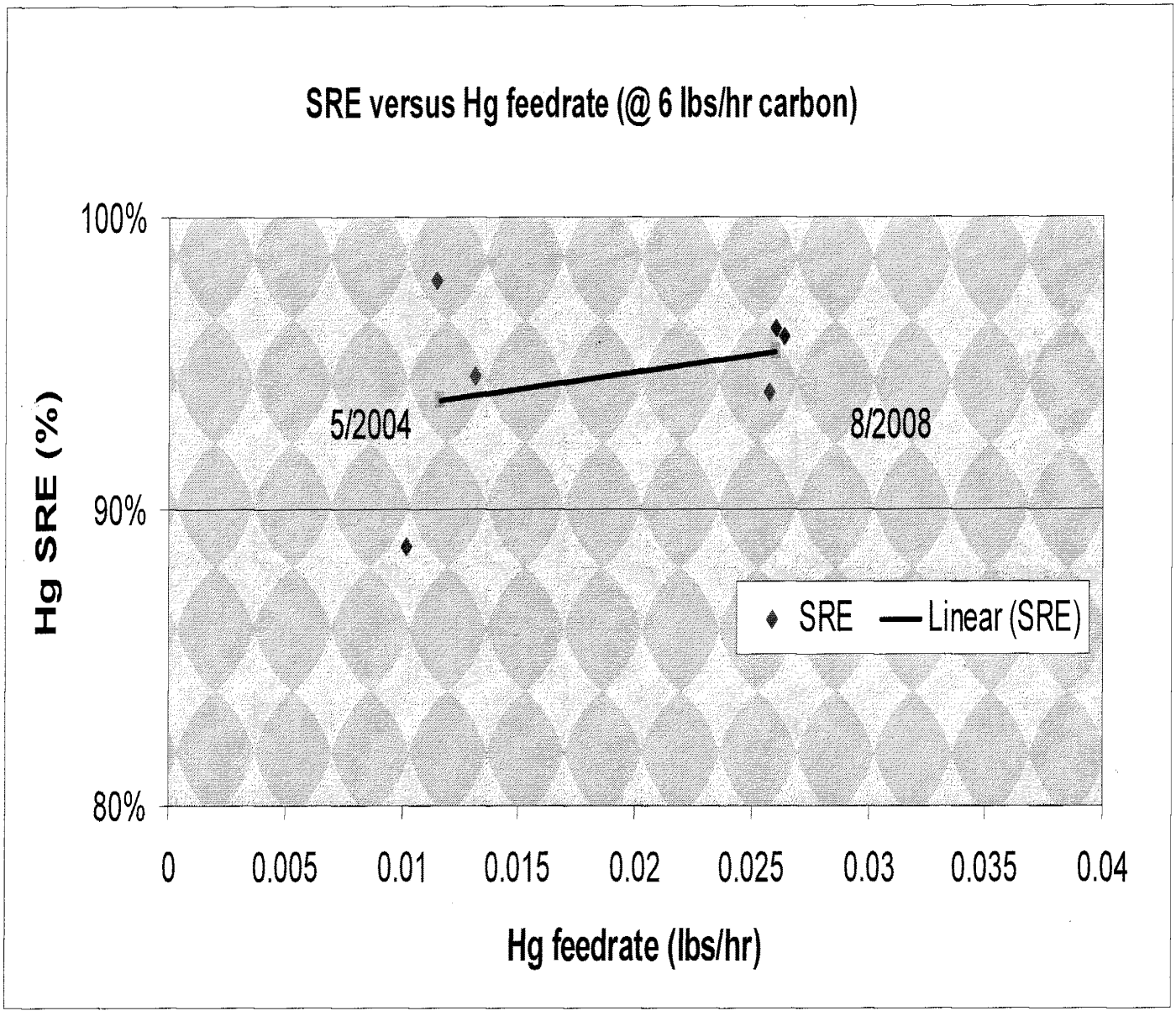

Testing conducted on May, 2004 (pt 1) was used as data in lieu for interim MACT standard compliance. Testing conducted on August, 2008 (pt 2) was testing conducted as required by June 5, 2008 USEPA letter and to demonstrate compliance with Final MACT Standards. Pt (2) test was conducted at 3.5 times the Mercury feed rate as pt (1). Pt (2) resulted in higher SRE's.

# Unit-3




Testing conducted on May, 2006 (pt 1) at the request of the IEPA was to verify the testing conducted on May, 2004 on Unit #2 being used as data in lieu for interim MACT Standard compliance for Unit #3. Testing conducted on August, 2008 (pt 2) was testing conducted as required by June 5, 2008 USEPA letter and to demonstrate compliance with the Final MACT Standards. Pt (2) was conducted at 3.1 times the Mercury feed rate at Pt (1). Pt (2) resulted in higher SRE's.

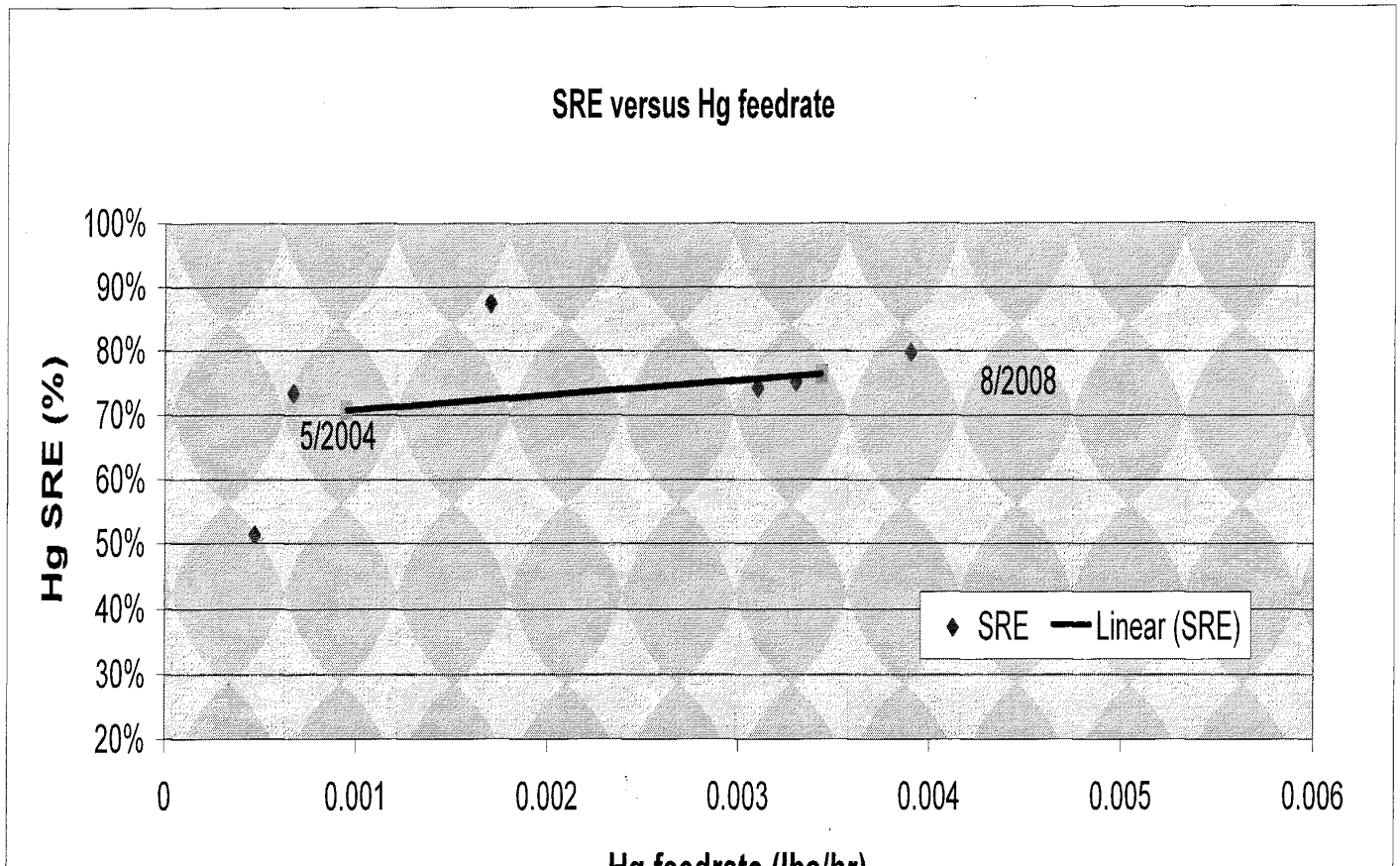
# Unit-4




Testing conducted on May, 2004 (pt 1) was used as data in lieu for interim MACT Standard Compliance. Testing conducted on August, 2008 (pt 2) was testing conducted as required by June 5, 2008 USEPA letter and to demonstrate compliance with the Final MACT Standards. Pt (2) was conducted at 2.2 times the Mercury feed rate as Pt (1). Pt (2) resulted in higher SRE's.

Unit-2

| | | | FEED | SRE | | FEED | SRE |
|---|---|---|---|---|---|---|---|
| 0 | 70% | May-04 | 0.00047 | 51.3% | 5/2004 Average | 0.000947 | 71% |
| 0.01 | 80% | | 0.0017 | 87.5% | 8/2008 Average | 0.003433 | 76% |
| 0.02 | 90% | | 0.00067 | 73.4% | | | |
| 0.03 | 100% | Aug-08 | 0.0039 | 79.7% | | | |
| 0.04 | | | 0.0033 | 75.1% | | | |
| 0.05 | | | 0.0031 | 74.2% | | | |
| 0.06 | | | | | | | |



Unit-2

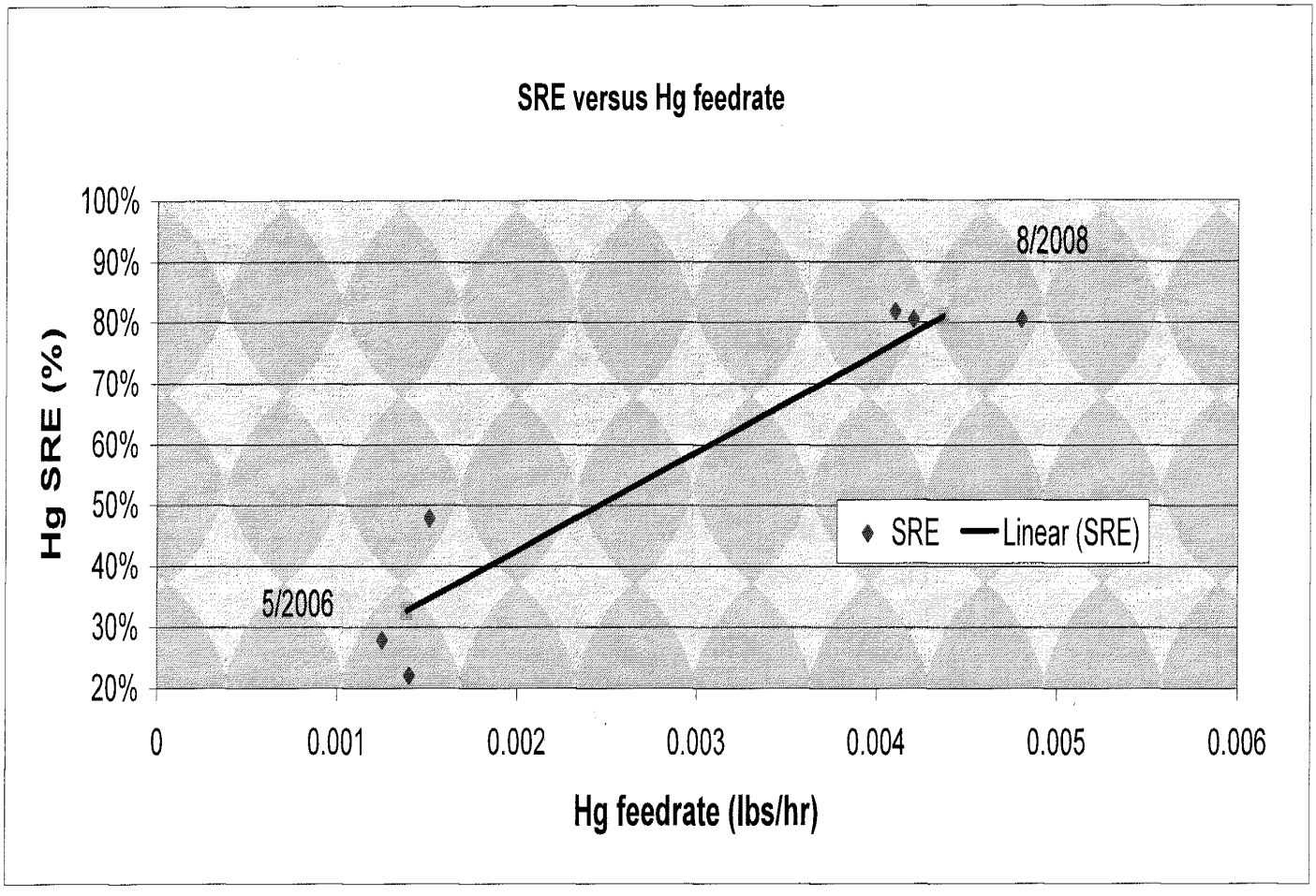
| Date | Feed (lb/hr) | Emissions (ug/dscm) | Emissions (lb/hr) | SRE |
|---|---|---|---|---|
| 5/5/2004 | 0.00047 | 15.8 | 0.000229 | 51.3 |
| 5/6/2004 | 0.0017 | 13.5 | 0.000212 | 87.5 |
| 5/6/2004 | 0.00067 | 11.1 | 0.000178 | 73.4 |
| 8/11/2008 | 0.0039 | 58 | 0.000791 | 79.7 |
| 8/12/2008 | 0.0033 | 58.2 | 0.000822 | 75.1 |
| 8/13/2008 | 0.0031 | 57.4 | 0.000799 | 74.2 |

Unit-2

Unit-2

Unit-3 Hg removal

| | | | FEED | SRE | | FEED | SRE |
|---|---|---|---|---|---|---|---|
| 0 | 70% | May-06 | 0.00125 | 27.9% | 5/2006 Average | 0.001387 | 33% |
| 0.01 | 80% | | 0.0014 | 22.1% | 8/2008 Average | 0.004367 | 81% |
| 0.02 | 90% | | 0.00151 | 47.8% | | | |
| 0.03 | 100% | Aug-08 | 0.0041 | 81.8% | | | |
| 0.04 | | | 0.0048 | 80.5% | | | |
| 0.05 | | | 0.0042 | 80.5% | | | |
| 0.06 | | | | | | | |



Unit-3 Hg removal

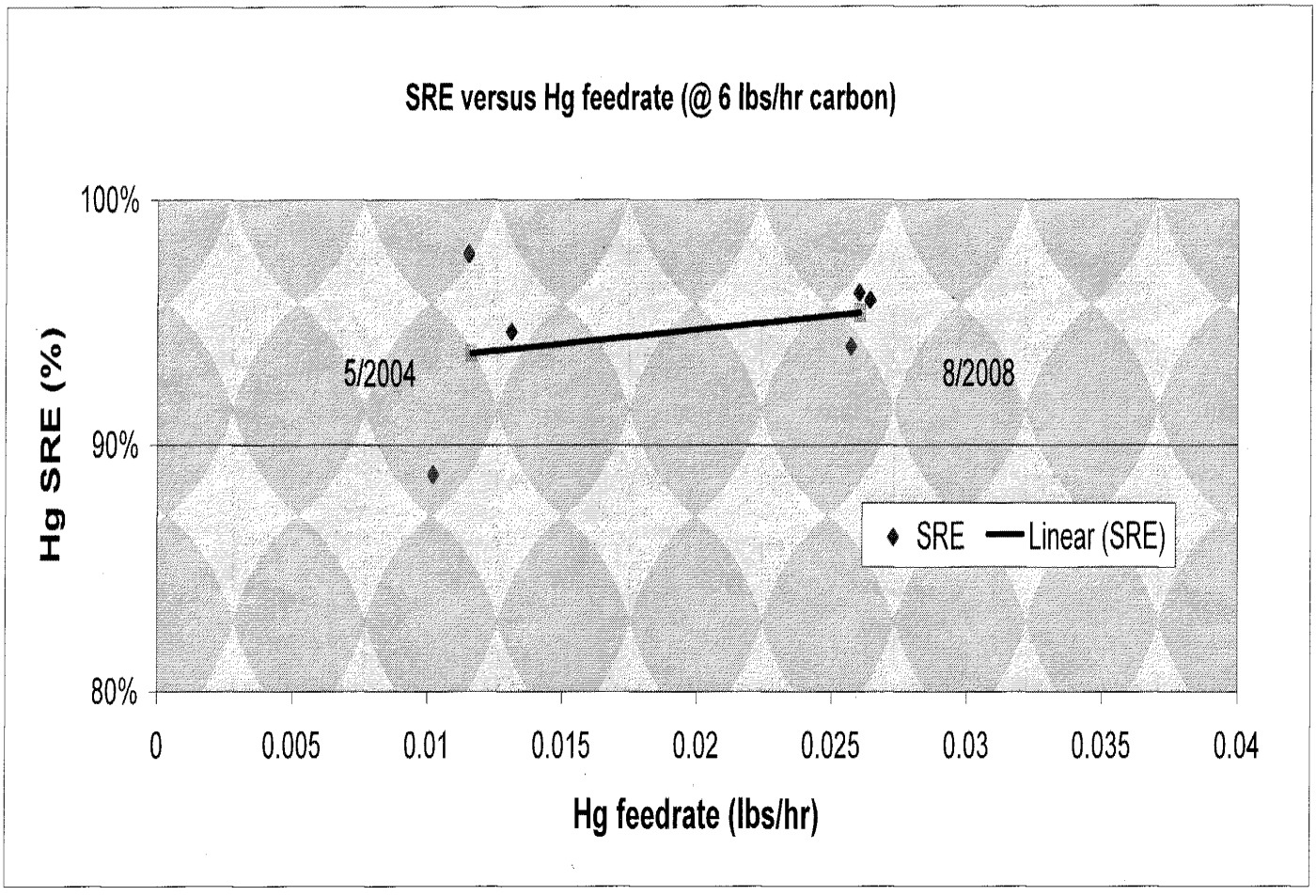
| Date | Feed (lb/hr) | Emissions (ug/dscm) | Emissions (lb/hr) | SRE |
|---|---|---|---|---|
| 5/10/2006 | 0.00125 | 70.3 | 0.000901 | 27.9 |
| 5/10/2006 | 0.0014 | 61.5 | 0.00109 | 22.1 |
| 5/11/2006 | 0.00151 | 52.7 | 0.000788 | 47.8 |
| | | | | |
| 8/5/2008 | 0.0041 | 54.8 | 0.000748 | 81.8 |
| 8/6/2008 | 0.0048 | 61.1 | 0.000938 | 80.5 |
| 8/7/2008 | 0.0042 | 57.5 | 0.000818 | 80.5 |

Unit-3 Hg removal

Unit-3 Hg removal

Unit-4 Hg removal

| | | | FEED | SRE | | FEED | SRE |
|---|---|---|---|---|---|---|---|
| 0 | 70% | May-04 | 0.0115 | 98% | 5/2004 Average | 0.0116 | 94% |
| 0.01 | 80% | | 0.0131 | 95% | 8/2008 Average | 0.026033 | 95% |
| 0.02 | 90% | | 0.0102 | 89% | | | |
| 0.03 | 100% | Aug-08 | 0.0257 | 94% | | | |
| 0.04 | | | 0.026 | 96% | | | |
| 0.05 | | | 0.0264 | 96% | | | |
| 0.06 | | | | | | | |



Unit-4 Hg removal

| Date | Feed (lb/hr) | Emissions (ug/dscm) | Emissions (lb/hr) | SRE |
|---|---|---|---|---|
| 5/4/2004 | 0.0115 | 6.6 | 0.000253 | 97.8 |
| 5/4/2004 | 0.0131 | 18 | 0.000703 | 94.6 |
| 5/4/2004 | 0.0102 | 29.1 | 0.00114 | 88.8 |
| 8/21/2008 | 0.0257 | 37.8 | 0.00153 | 94.0 |
| 8/22/2008 | 0.026 | 24.3 | 0.000996 | 96.2 |
| 8/23/2008 | 0.0264 | 25 | 0.00108 | 95.9 |

Unit-4 Hg removal

Unit-4 Hg removal